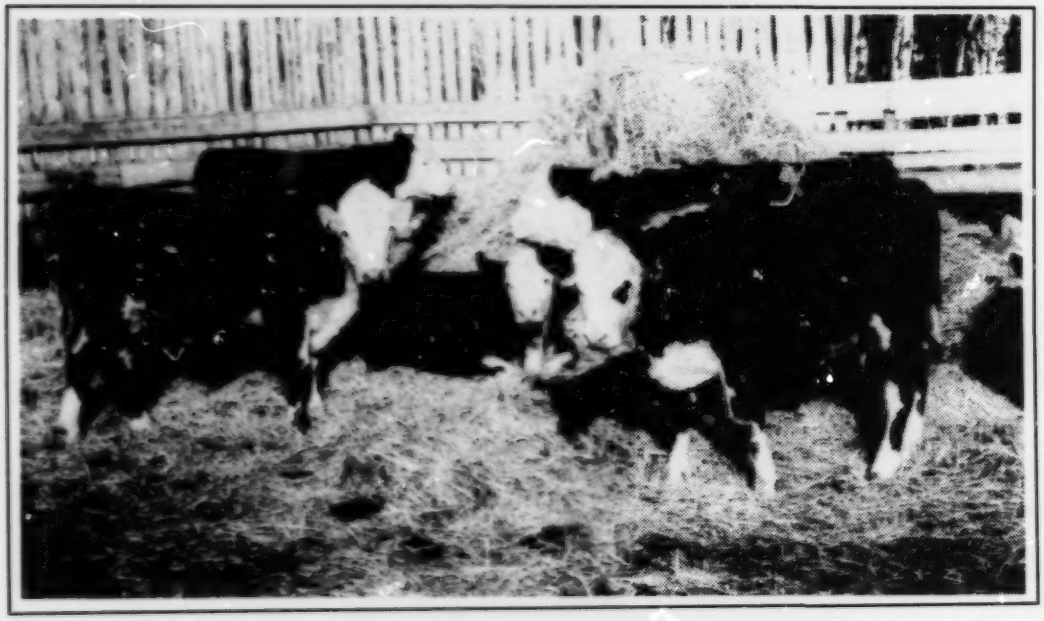
1991 MANITOBA BEEF CATTLE SEMINAR JANUARY 22nd-23rd



Manitoba Agriculture

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ACKNOWLEDGEMENTS

We hope that you enjoy the 1991 MANITOBA BEEF CATTLE SEMINAR. I would like to thank Dr. Guenther Rahnefeld, Agriculture Canada, and Norm Hemstad, Manitoba Agriculture for their assistance in contacting speakers, chairing sessions, and planning this seminar. As well, we appreciated the input of Glen Barclay - Feed-Rite, Clair Manshreck, Lyle McNichol, Lyall Edgerton, and Doug McLaren on the initial planning committee. And a special thanks to the Manitoba Beef Cattle Performance Association for their administrative assistance.

Keith Levenick, Principal
Agricultural Extension Centre

MANITOBA BEEF CATTLE SEMINAR

January 22 & 23, 1991
Agricultural Extension Centre
Brandon, Manitoba

The 17th BEEF CATTLE SEMINAR features a variety of excellent speakers. Topics range from day-to-day management practices to long-range breeding programs.

Of special interest will be the sessions on the "Future of the Beef Industry! Where is it headed? How will Manitoba fit?" These are two questions that Manitoba cattlemen are asking today. Join us for a look into the future.

Last year you indicated that one day was too short. This year we are going from noon-to-noon, giving more time to visit friends, talk to speakers, and visit the displays. Come and enjoy!

AGENDA

TUESDAY, JANUARY 22, 1991

Chairperson... Norm Hemstad, Manitoba Agriculture, Brandon

12:00 Noon	Lunch available at Ag. Centre
12:30	Registration
1:15	Opening Remarks
1:20	**Fly Control: Ear Tags, Dust Bags – What Works? Where?** – Dr. Terry Galloway, University of Manitoba, Winnipeg, Manitoba
1:45	Question Period
2:00	**H.E.R.D (Replacement Heifer Development)** – Dr. John Jacobsen, MSD Agvet, Calgary, Alberta
2:30	Question Period
2:45	Coffee
3:15	**Non-Traditional Feedstuffs for Ruminants** – Vern Anderson, Research & Extension Specialist – Carrington, North Dakota
4:00	Question Period
4:15	**Trace Mineral Update** – Bill Steeds, Nutritionist, Manitoba Agriculture, Winnipeg, Manitoba
4:45	Question Period & Visit Displays
6:00	Supper – Roast Beef – Ag. Ext. Centre
7:00 - 9:00	**The North American Beef Industry in the Next 10 Years** – Where are we headed vis-a-vis the packers, grading systems, consumer demand, role of the producer? – W.H. Buckner, Vice-President, Cargill, High River, Alberta
9:00	**Bull Session** in Recreation Room

WEDNESDAY, JANUARY 23, 1991

Chairperson... Dr. Guenther Rahnefeld, Agriculture Canada, Brandon

7:00 a.m.	**Breakfast** – Ag. Extension Centre
8:30	**Herd Health Year-Round** – Dr. John Jacobsen, MSD Agvet, Calgary, Alberta
9:15	Question Period
9:30	**E.P.D.'s – What Are They Doing For Us?** – Milton Weiss, Beef Consultant, Pincher Creek, Alberta
10:15	Question Period
10:30	Coffee and Visit Displays
10:45	**Evaluating Breeding Bulls** – Dr. Chris Belan, D.V.M., Regina, Saskatchewan
11:15	Question Period
11:30	**Manitoba's Position in a Changing Beef Picture** – Maurice Kraut, Canada Grains Council, Winnipeg
12:00	Questions and Adjournment
12:30 p.m.	Lunch (available at Ag. Centre)

SEMINAR SPEAKERS

VERN ANDERSON – Has been conducting research and extension demonstrations in non-traditional foodstuffs at the Carrington N.D. station. This North Dakota work will find many applications on Manitoba farms.

DR. CHRIS BELAN – In his private practice in Regina, he has developed a specialty in Bull Evaluation. He comes to us highly recommended by the participants at the Roblin Bull Test Station.

W.H. BUCKNER – Bill is the Cargill Vice-President in charge of the new High River beef packing plant. Being right at the centre of a rapidly changing North American beef industry, he will share his thoughts on the future – from consumer demand to the producer role.

DR. TERRY GALLOWAY – A researcher with the University of Manitoba Entomology department for 14 years, Dr. Galloway brings a very practical approach to fly control in cattle.

SEMINAR SPEAKERS

DR. JOHN JACOBSEN – John recently joined MSD-Agvet in Calgary, after 8 years in private practice at Cochrane. Working mainly with cow-calf operators running 200 - 650 cows, he emphasizes using a year round approach to herd health.

MAURICE KRAUT – A well-known cattle market analyst on CBC radio, Maurice is currently Director of the Canada Grains Council in Winnipeg. He will draw on his years of experience with the prairie beef industry to focus on Manitoba's future.

BILL STEEDS – Trace mineral levels and ratios are a problem in many parts of Manitoba. Bill Steeds, Manitoba's Provincial Animal Nutritionist, will discuss these problems and treatments.

MILTON WEISS – Genetic advisor and consultant for the Canadian Charolais Association for 20 years – instrumental in Charolais Association adopting the use of E.P.D.'s in their performance program.

HORN FLY CONTROL IN MANITOBA - WHAT ARE THE ALTERNATIVES?

T.D. GALLOWAY
Dept. of Entomology, University of Manitoba, Winnipeg

Pastured cattle can suffer terribly from attack by a myriad of different biting fly species. In areas where drainage is poor, and in years with abundant rainfall, mosquitoes feed on the cattle mainly at dawn and dusk. However, if the animals move through tall grass or into wooded areas, mosquitoes will not hesitate to take advantage of a ready meal. Horse flies, sometimes called bulldogs, inflict painful bites and attack cattle mainly on hot sunny days. Their persistent attempts to feed, and their aggrevating flight patterns affect the manner in which cattle behave and utilize available forage. Stable flies are often pests of pastured cattle, and feed on the legs and lower body regions. They too have a painful bite, and animals will continuously stomp their feet and toss their heads down to dislodge feeding flies. Black flies breed in moving water, and when cattle are pastured nearby, adults of blood-feeding species are often abundant around the animals, attacking the ears in particular. The impact of no-see-ums on cattle is not well understood, but they definitely can cause severe annoyance when present in large numbers. The face fly is not usually abundant in Manitoba, nor does it have biting mouthparts. However, their behaviour of feeding on secretions around the eyes and nostrils causes a disturbance. The role of the face fly as a vector of pinkeye pathogens needs further investigation.

As diverse as all these flies are in the manner in which they

attack and feed on cattle, they share one common trait - an individual fly spends very little time in actual contact with the host. They visit the animal briefly, take a blood or fluid meal and then disperse to digest their meal elsewhere. The horn fly is unique among the Manitoba cattle pests in that it is about as close to a true ectoparasite that a fly can be, and still remain free-living. Eggs are laid in fresh cattle dung, and the maggots, or larvae, feed on the dung, eventually leaving the pat to enter a pupal or transitional stage. In this stage, the entire insect is rearranged from the legless maggot to a fully winged and capable adult fly. These emerging flies make their way directly to a host animal, most often cattle, where they settle onto the back and begin to feed on blood. Both males and females take blood, up to 30 time a day. Because of their dependence on these numerous blood meals, their behaviour is such that they leave their host only with reluctance. When the animal flashes its tail or tosses its head back, the flies will rise in a cloud, only to settle again in a split second as if attracted to a magnet. Females leave the animal only long enough to deposit a few eggs into freshly dropped faeces, and then they return to the animal. Depending on the nature of the spring, horn flies appear on cattle in April and are present until a killing frost. They may be extremely numerous, and on some mature animals, especially bulls with heavily developed neck muscles, there may be over 2000 flies. When you multiply the number of flies by the number of bites each fly takes, the stress from their attack can be appreciated.

As it happens, the strict dependency of the horn fly on its host has been its undoing. Ever since the first insecticides were developed for application to livestock, it was apparent that a small amount of chemical on the animal's body would provide excellent horn fly control. These flies remain on the body, and therefore in direct contact with the applied materials. In the case of the other cattle pests, however, they spend so little time on the animal, that only the most toxic chemicals, or chemicals applied at high rates provided adequate protection.

Because of the particular suseptibility of the horn flies to insecticide applications, there has been a tremendous diversity of means by which the chemicals are delivered to the animal. Ready-to-use formulations of insecticides or emulsifiable concentrates (which may be mixed with water) may be sprayed directly onto the animal. Insecticides may be mixed with a petroleum-based product and applied using self treatment devices such as mops or oilers. Dust formulations are used in variously designed bags which the animals rub against or pass under. Delivery systems using oilers or bags are usually arranged in such a way that the animals are forced to succumb to treatment, most often while passing through for combinations of water, mineral or feed. Free-choice situations may be less satisfactory unless animals are adapted to using the control devices. Ear tags or tapes impregnated with insecticides deliver small concentrations of active ingredient over the body of the animal for a prolonged period of time. No matter what technique is selected, all of these control strategies will provide

cattle producers with excellent horn fly control on their animals, as long as they are used properly and efficiently, and compounds are effective.

When impregnated ear tags first became available for horn fly control in Manitoba, they had two distinct advantages over conventional control strategies. First of all, most products contained a relatively new family of active ingredients, the synthetic pyrethroids. These include fenvalerate, permethrin and flucythrinate, for example. These active ingredients are extremely toxic to insects, while being relatively safe to apply to the cattle. Consequently, the small amount of material bleeding out of the tags over time was sufficient to very effectively reduce horn fly populations. The second major advantage to the use of ear tags was that they could be installed at the beginning of the season when animals were being turned out to pasture, and were virtually maintenance free for the remainder of the year. A producer could be quite confident that season long horn fly control would be provided.

Unfortunately, there is one undesirable trait associated with the pattern of release of chemical from the ear tags. Relatively high concentrations are released initially resulting in high residues on the hair. As the season progresses, the rate of release declines, and residues drop. In combination with the tendancy of the horn fly to remain in contact with its host, there is a continuous selection process for survival of the most tolerant individual flies, particularly at the end of the season when

residues are at their lowest levels. Resistance in horn flies as a result of this selection to the synthetic pyrethroids was first recorded by D.C. Sheppard in 1984 in the United States. This was only three years after the first pyrethroid ear tag was registered for use in Canada. After the initial reports of resistance in the southeastern United States, resistant populations were discovered across the southern U.S., and thereafter spreading northward through the midwest. The first unconfirmed reports of resistance in Canada came from southwestern Saskatchewan in 1986, and resistance was confirmed in Saskatchewan and Manitoba in 1987. Since that time, the prevalence and intensity of pyrethroid resistance has continued to spread in Manitoba, until in 1990, we find resistance in every cattle-producing region in the province. That is not to say that suseptible populations are not present here any longer, but the incidence of resistant horn flies is so great as to jeopardize continued use of pyrethroids.

At the moment, continued reliance on pyrethroids for horn fly control does not look particularly good. There are more active pyrethroids or pyrethroids may be synergized to increase their activity. However, in the end, in the face of continued selection by materials which are metabolized in a similar manner to existing compounds, the flies will probably come out ahead. Resistance to pyrethroids also seems to be a relatively stable trait in a horn fly population once it has developed. In the absence of pyrethroid selection for an entire season at the Glenlea Research Station, levels of resistance did not change substantially.

Consequently, it is important that producers implement alternate means of horn fly control in their herds as soon as possible. There is no evidence that horn flies have developed a tolerance to any of the organophosphate insecticides. These include the active ingredients most often used in oilers and dust bags, as well as a single active, tetrachlovinphos, formulated in ear tags. In should be kept in mind that should a horn fly population be subjected to sufficient selection by any of these compounds, there is the liklihood that horn flies will similarly develop resitance to them. It may be possible to alternate these various compounds and application strategies in rotation with pyrethroids where resistance to the latter has not yet been observed. Where producers have observed pyrethroid ear tag failure, alternate families of chemicals must be used to achieve satisfactory control. We do not now know whether pyrethroids may be successfully reimplemented following several years application of alternate materials in Manitoba.

There are other active ingredients that may some day be added to the producer's depleted arsenal of chemical weapons to fight horn flies. A pour-on formulation of avermectin provided excellent short term control of pyrethoid-resistant horn flies in trials in Manitoba in 1990. Boluses containing the synthetic insect hormone, diflubenzuron, are available in the United States. These boluses are deposited into the rumen of the animal and residues are passed in the faeces in sufficient concentrations to kill developing maggots. It remains to be seen whether these products will be

registered in Canada in the future.

Producers are faced with a more complicated decision in their selection of means to control horn flies than ever before. It is important that producers become familiar with the active ingredients available for application, and maintain a strict rotation of strategies for control. They must also keep a watchful eye for evidence that resistance to chosen strategies is developing. Any noticeable increase in the number of flies over what you have come to expect may be a sign that the chemical delivery system is not working properly, or it could mean that you are seeing the initial stages of resistance development.

There is considerable concern that application of insecticides using sustained release systems may result in rapid development of resistance because of the continuous selection pressure on horn fly populations. If this is the case, producers will face more severe restrictions on the choice of chemicals available for horn fly control. Researchers will be forced to explore inovative approaches, including biological and physical control techniques. The one thing that is certain is that strategies for horn fly control will undergo substantial change in the near future.

Alternative Feeds For Ruminants

V. L. Anderson
Carrington Research Extension Center
North Dakota State University

Cattlemen across the Northern Plains are the most resouceful people in agriculture. We are faced with managing cattle in an environment with highly variable and stressful weather, uncertain economics and great distances to supplies and markets. Ruminant animals are just as resourcful in their ability to utilize many varied plant products for sustinence. Traditional grazing of native and improved pastures will continue to be the backbone of livestock production but efficient utilization of all available resources may make the difference between efficient and profitable or economically marginal operations.. This paper is a discussion of alternative feeds and their value for ruminant animals.

Choosing alternative feeds will depend on some basic criteria. After realizing a supply of some potential feed is available, nutrient analysis is required to characterize the protein and energy value. Mineral contents vary greatly in many alternative feeds suggesting the analysis include calcium and phosphorous. Palatability is important, especially if the product is objectionable. However, mixing with other feeds, especially silages, can enhance consumption less palatable feeds. Cost is the final consideration. Each feed is evaluated in comparison to more traditional feeds on a cost per pound of protein or TDN basis.

Balancing rations is important with any feeds but especially critical with unusual feeds. Some are less nutrtious requiring additional supplementation. Others are high in only one nutrient. Balance the ration to meet the needs of the animal and the production goals you are targeting.

The greatest single source of alternative feeds is crop residue. In fact many may not consider crop residue as alternative feed at all. We can, however, consider using crop residues in some areas of production, such as lactating cows, where they have not been traditionally exploited. Straw and chaff are most plentiful but screenings and corn stover can make a contribution to many livestock diets. Oats straw is highest in feed value, followed by a closely clustered group of barley, wheat and durum. Rye straw is very low in nutrition and if not ammoniated, would be of little value as a feed. Feed value varies greatly based on soil fertility, variety,

climate, time of harvest and length of storage. Residues require added mineral and Vitamin A supplementation compared to more common hay and silages.

Sunflower head residue and screenings are very platable for beef cows but the screenings are quite high in oil so must be fed judiciously.

We have not been very efficient in collecting straw and chaff. Many individual farmers are resourceful enough to invent a system or adapt equipment to collect all crop residue as it comes from the combine. Once chaff and straw hits the ground, a substantial portion is lost. Understand that removing straw and chaff will reduce the soil organic matter. Applying manure will mediate this effect. How much manure is required and how often it needs to be applied is the subject of a current study at the Carrington Station

With the use of large amounts of straw and chaff, comes the need for added protein supplements. Wheat screenings contain as high as18% protein and are frequently available at reasonable prices. However, the digestibility is lower unless screenings are ground. This also destroys the germ of the weed seed. Composting of manure from screenings fed animals is recommeded to insure the weed cyce is broken. On a cost per pound of protein, wheat screenings are still consistently very economical. Many high protein by-product feeds are produced from from agriculture processing activities. The following table gives values for protein and TDN for some of the more common by-product feeds. Malt products are the remains of the barley malted for beer and include light barley and dried sprouts.

BY-PRODUCT FEEDS FOR PROTEIN

	TDN	PROTEIN
Sunflower Meal	70-73	28-44
Soybean Meal	90	44
Rapeseed Meal	77	38
Linseed Meal	80	40
Malt Products	65-75	18-28
Distillers Products	65-80	18-30
Sugar Beet Pulp	72	10

In order to maximize the use of crop residues, it is possible to feed cows under different management systems. Drylot fed beef cows during the lactation period can consume up to 50% of their diet dry matter in the form of straw or chaff. Research at Carrington Station has focused on "low input" cow calf production using drylot as a way to mazimize ruminant use of straw. The following information summarizes cow/calf performance on high and low residue diets during three years of trials. Hereford and Hereford cross cows were fedbalanced diets for average milking cows containing limited amounts of grass/alfalfa hay at two levels and screenings-corn combinations for protein. Residue was offered free choice. Calves were offered equal amounts of creep feed per pen. Natural service sires were exposed to each pen for a 50 day breeding season.

HIGH RESIDUE DIETS FOR LACTATING BEEF COWS
(3 YEAR SUMMARY)

	HIGH RESIDUE DIET	LOW RESIDUE DIET
BREEDING SEASON RATION		
Alfalfa/Grass Hay (lbs)	8.5	13.8
Concentrate (lbs)		4.7
Residue (lbs) (free choice)	25.8	16.3
POST BREEDING SEASON		
Alfalfa/Grass Hay (lbs)	10.9	16.4
Residue (lbs) (free choice)	16.8	14.1

High Residue Diets for Lactating Beef Cows (3 year Summary)

COW PERFORMANCE	HIGH RESIDUE DIET	LOW RESIDUE DIET	ST.ERR
Number of Pairs	64	64	64
Post calving wt(lbs.)	1178	1172	11
Weight at Wn(lbs)	1149	1151	10
Weight change	-32	-17	6
Percent Open	9	5	
CALF PERFORMANCE			
Post calving start wt(lbs.)	141	140	2.42
Weaning weight(lbs)(lbs.)	445	437	4.18
Average Daily Gain(lbs.)	2.20	2.14	.03

Satisfactory weight gains were observed but rebreeding was marginal. Modeling the average east central North Dakota farm would suggest 85 beef cows could be supported on crop residue and alternative feeds from a typical 1120 acre farm adding $22,467 to the gross income.

Altenative feeds are not limited to crop residues. Annual forages are very important in many situations and can be included in crop rotations on a regular basis. Traditionaly, foxtail or "Siberian" millet has occupied many acres on beef cow operations. Proso millet is also an excellent forage. Millets should not be fed to horses. Pearl millet, a warm season grass shows great potential for hay or silage. Sudangrass, and forage sorghums are very productive and palatable. Triticale has not been particularly productive and offers the potential problem with ergot. Amaranth, a close relative of pigweed is getting some attention for human food but offers some potential as a silage crop. Jerusalem artichokes were not highly prized for forage production or feed value.

Legumes can provide either forage or protein feed. Sweetclover is a popular plow down for green manure but makes a palatable feed if cured and harvested properly. Lupines are less well known. The sweet white lupine produces a bean that can be directly fed with no processing to all classes of livestock. Edible beans, either culls or splits, make good protein feed but must be limited due to laxative effects. The whole plant is useful for forage but the bean content will dictate what proportion of the ration is whole bean hay or silage. Soybeans were origianlly introduced as a forage crop. Limited quantities of residue are available now from grain production. Pods and leaves are nutritons but hard to collect. Growing soybeans or pinto beans on the same field with corn or some other grass crop for silage will increase the protein content of the harvested forage. Several multi-cropping studies are in progress for both grain and forage production at the Carrington Station.

There are many other alternative feeds available on a localized basis. Russian thistle and kochia make acceptable feeds if ensiled. Some long season domesticated kochia varieties are available that do not set seed. Slough hay has some value especially the finer stemmed grasses but quality depends on harvest date. Cattail and bullrush are essentially useful only for bedding. Potato waste is fed to both cows and feedlot cattle. The risk of choking suggests chopping or grinding and mixing with other feed. Feeding potatoes is associated with strong and unpleasant odors in the feedlot area. Sugar beet tops make acceptable feed if wilted or ensiled with dry forages.

Other unusual feeds may include food processing by-products such as aquatic plants, municipal waste or forest products. Recylcing animal waste offers some efficiencies when manure from one species or production cycle is processed and fed to another. For example swine feeder waste is ensiled with a forage crop and fed to ruminants or feedlot manure from fattening animals is mixed with a silage and fed to beef cows. Some would question the ethical position of this practice but it occurs in nature as in the case of the rabbit. Research has shown poultry waste to be most valuable because of the nitrogen content.

An excellent reference on alternative feeds is available for $21.95(US); Underutilized Resources as Animal Feedstuffs published by the National Acadamy Press, 2101 Constitution Avenue, Washington DC. 20418

TRACE MINERAL UPDATE

W.G. Steeds
Animal Industry Branch, Manitoba Agriculture

An unidentified deficiency severely limiting growth and reproductive performance of cattle was identified in the Swan Valley as early as 1900. It was not until 1953 that a copper deficiency was documented. Studies since then have shown deficiencies of other trace minerals including zinc, manganese and selenium.

Until 10-12 years ago it was generally thought that the problem was confined to the northwest region of Manitoba. In the early 1980's, a dairy producer in the Morden area experienced major problems where his cows stopped breeding, essentially stopped milking and turned a grey color - a classic sign of copper deficiency. Supplementation with 2 grams of copper sulfate per cow per day corrected the problem within a few months. This incident was surprising to say the least. It was one thing to have trace mineral problems in the Swan Valley and attribute them to geology peculiar to the area, and quite another to have a severe copper deficiency in the Morden area. Around this same time, a producer in the Miami area complained about cattle doing poorly on pasture and reporting major improvements when liquid supplement was fed - improvement we could not attribute to energy and protein. We decided to do a small pasture survey just in case there might be the odd copper deficient field, and the rest is history.

In all, five pasture surveys were done by Manitoba Agriculture - in St. Claude/Miami, Gladstone, Steinbach, Treherne/Holland and Melita/Souris. All showed copper deficiency from either low copper, high molybdenum, or both, plus low zinc and manganese. For example, the Melita/Souris survey of 21 producers and 46 legal descriptions showed an average of 1.4 mg/kg of copper, 1.3 mg/kg of molybdenum, 9.3 mg/kg zinc and 28.6 mg/kg manganese. Fourteen of

the sites showed copper as less than 2 times the level of molybdenum, and 3 sites showed more molybdenum than copper. Requirements are that copper level be at least 10 mg/kg, and be a least 2 times and preferably 4 times the level of molybdenum. Zinc and manganese requirements are 30 and 40 mg/kg respectively.

Trace minerals are required in extremely small quantities. One mg/kg is the equivalent of 1 cent in $10,000, one ounce in 62,500 lbs. or 1 kg in 1,000 tonnes. To make things more complicated, these trace minerals interact with each other. For example, a particular level of copper intake can be either deficient or toxic in the animal, depending on the relative intakes of molybdenum, sulfur, zinc and iron. Finally, the sensitivity of particular body functions to lack of essential trace mineral vary in different species and within species. They also vary with age and sex of animal. For example, while cattle can tolerate up to 115 mg/kg, toxic level of copper in sheep is as low as 10 mg/kg. Zinc requirement for proper testicular growth and normal sperm production is significantly higher than the level required for normal growth and appetite. Finally, don't blame trace mineral deficiency for problems until you have made sure the ration is properly balanced for energy, protein, vitamins and calcium and phosphorus. When specific trace mineral deficiencies are properly diagnosed, supplements can correct problems simply and inexpensively. Unfortunately, trace mineral deficiencies are commonly used as the excuse for poor production when the real problem may be poor management.

Because of the potential toxicity of trace minerals and the extremely small amounts involved, random supplementation is very hazardous.

Trace minerals that may be deficient or that are known to cause problems in Manitoba include:

1. Copper (Cu)
2. Molybdenum (Mo)
3. Selenium (Se)
4. Zinc (Zn)
5. Manganese (Mn)
6. Cobalt (Co)
7. Iodine (I)

Space and time do not allow a full review of all the symptoms and effects of deficiencies for all these minerals. However, very briefly, both cobalt and iodine requirements can be met by using blue salt free choice. Red salt is plain white salt plus iodine. Blue salt is red salt plus cobalt. Feed blue salt.

Perhaps most important, since reproductive efficiency is more important economically than any other single factor. Trace minerals have a significant effect on reproductive performance. Low copper results in infertility, low zinc results in infertility in the female and poor testicular development in the male (reversible), and low selenium in retained placentas.

More specifically, copper deficiency in cattle results in general unthriftiness, stunted growth, rough hair coat, loss of hair color with hair turning greyish or becoming very faded and low milk production. Calves born to cows having adequate copper status will have adequate stores of copper to prevent deficiency for 5-6 months. However, calves born to cows with low copper status will be immediately deficient, and since milk is very low in copper, there will be no improvement. Calves born very deficient in copper can have enlarged hearts and commonly die soon after birth of cardiac failure.

January and February calves born with proper copper reserves may be becoming deficient by the time they go on early pasture. Copper deficient calves commonly scour and have a rough hair coat.

Molybdenum is most notable for its effect in reducing availability of dietary copper. It is impossible to distinguish between the effects of copper deficiency caused by low copper or high molybdenum. Despite the problem it causes, molybdenum itself is an essential trace mineral in its own right, being an essential part of several enzymes. Here is a classic example of a trace mineral essential in the proper amount, yet devastating to animal health and production if present in excess.

The most widely recognized symptom of zinc deficiency is both hooves and horns becoming brittle and cracked. In addition, low zinc can reduce growth rate, affect skin condition and cause reproductive problems. Zinc levels commonly found in Manitoba are approximately half of the 30 mg/kg required.

Manganese deficiency results in reproductive failure in both males and females, and in bone abnormalities such as enlarged joints, stiffness and buckling over at the knees, particularly in new born calves. Manganese is commonly found in Manitoba forages at 60-80% of the 40 mg/kg requirement.

The above trace minerals - copper, zinc and manganese - are the three known to be deficient in Manitoba.

Selenium is left to last because it is the least understood trace mineral in terms of extent of deficiency, and acceptable methods and levels of supplementation. A major practical problem with selenium is the very small difference between deficient, acceptable and toxic levels. The requirement for selenium is 0.20 mg/kg, and the toxic level 2 mg/kg. Remember, we are talking about the equivalent difference between 1/5 of a cent and 2 cents in $10,000, one level meeting requirements and the other being toxic. To make matters more complicated, since selenium and vitamin E interact and

can replace each other to some extent, for beef cattle the selenium requirement depends on the amount of vitamin E in the diet.

One telltale sign of selenium deficiency is an abnormally high rate of retained placentas. Dr. Jim Dyck and his colleague from Swan River have undoubtedly done more with selenium over the years than has been done anywhere else in Manitoba. In his paper last year to the same conference, he described selenium deficiency symptoms including open cows at pregnancy checking time still having enlarged and abnormal feeling uteruses, good growthy exotic heifers cycling well, but with poor conception. He noted more lameness in selenium deficient cattle, since selenium is important in proper muscle function. He also noted that selenium is involved in the immune system, and reported poor responses to antibiotics until vitamin E - selenium was added to the treatment. His words sum up selenium deficiency well, "selenium is much more subtle (than the other trace minerals) ... it's effect can be seen as a lot of other things".

Although it does not seem possible to predict the occurrence or determine the specific cause, in some year many calves are born unable or unwilling to get up and suck. A shot of vitamin E-selenium seems to turn things around within a few hours, and there are now many cattle producers in Manitoba that routinely give calves a shot of vitamin E-selenium at birth.

Selenium toxicity in mature cattle, in the few cases that we have seen, shows up as a severe inflammation where the hair meets the hoof and in between the claws, with feet being sore. The hoof loses its waxy coating and has a dry stringy look running vertically on the affected part. Since the hooves grow at about ¼" per month, the extent of loss of the waxy coating is a good indication of how long the diet has contained excess selenium.

WHAT DO WE DO ABOUT IT? HOW DO WE SUPPLEMENT?

In the ten years since it has been determined that copper, zinc and manganese, and perhaps selenium, are deficient throughout Manitoba, the feed industry has done an excellent job of increasing trace mineral levels in mineral supplements to where they now meet requirements. For example, copper levels in old type minerals were 200-300 mg/kg. One ounce of this mineral fed per cow per day increased copper in the diet less than one mg/kg. One ounce of the new highly fortified mineral containing more than 2000 mg/kg of copper raises copper in the total diet about 7 mg/kg, or enough to meet requirement with most feeds. Both zinc and manganese have similarly been raised to where one ounce of mineral per cow per day in addition to the forage basically meets animal requirements. My advice to beef producers is to buy a mineral supplement containing more than 2000 mg/kg of copper from a reputable Manitoba feed company. If it doesn't have at least 2000 mg/kg of copper listed on the tag, don't buy it. One ounce per day of this mineral will, on average, satisfy requirements for the three trace minerals deficient in Manitoba forages - copper, zinc and manganese. Most of these mineral mixes also contain selenium at a level which will satisfy requirements if used as directed on the feed tag.

Copper sulfate can be used to raise copper levels in mineral mixes. Do not do this unless you have a good reason - including a feed test showing trace mineral levels and a good idea of exactly how much mineral your animals eat. Although the toxic level for copper is 115 mg/kg - ten times the requirement - people do go overboard. A dairy farmer called one day to say that the veterinarian had been out and recommended 2 grams of copper sulfate for all animals in the barn. The producer had given 2 ounces (there are 28 grams per ounce) instead and several small calves expired within the hour.

Last year a cow-calf producer was trying to raise copper levels slightly by adding one gallon of copper sulfate per 100 bushels of barley, and feeding 10 pounds of barley per cow per day. That sounds harmless enough, but, in fact, one gallon of copper sulfate in 100 bushels of barley raised the copper level in the grain by 625 mg/kg, and at 10 pounds of barley per cow per day, raised the total ration copper by 250 mg/kg. This would eventually cause problems.

On the other hand, we know that one kilogram of copper sulfate added to a 25 kg bag of mineral and well mixed in will raise the level of copper to a cow eating one ounce of mineral per day by 20 mg/kg. Where forage has been shown to be very low in copper, with molybdenum or sulfur or both tying up the copper, adding 0.5-1.0 kg of copper sulfate to a bag of mineral to raise the ration of copper 10-20 mg/kg may be a good management technique. I can't emphasize enough that before you do this, get help in making sure your assumptions are correct and that you have not overlooked anything. The "one aspirin is good - two must be better" approach is not the one to use with trace minerals.

We said that calves born with a good copper status have adequate for up to six months. However, this means that for calves born in January or February and going to pasture in June, a deficiency during the summer is likely. Some producers find it pays to inject calves with copper before going on pasture, and some re-inject part way through the summer. Some lumps do occur at the injection site but if clean needles are used, lumps are kept to a minimum and usually disappear within a few weeks. Copper oxide needles made to realease copper slowly in the rumen are not available in Canada.

Zinc and manganese requirements should be met with no further supplementation if an ounce a day of the proper mineral mix is consumed. I realize that getting adequate mineral into cattle can be a major problem.

Although each case is unique, many producers resort to mixing mineral with salt, top dressing mineral on silage or adding it to grain.

Selenium supplementation is extremely touchy because of the narrow margins between meeting requirements and toxicity. Buy a mineral mix containing selenium and feed it according to instructions on the tag. This always includes a warning not to use this mineral along with any other product containing selenium. Take this warning seriously.

Apart from giving new born calves a shot of vitamin E-selenium or doing the same for cows shortly before calving to avoid retained placentas where they have been a problem, we don't recommend use of more selenium. We simply don't have enough answers to selenium deficiency and toxicity.

In summary, balance your rations, check your feed and water for trace mineral levels, then get help from a qualified professional in developing a trace mineral program for your farm.

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THE NORTH AMERICAN BEEF INDUSTRY IN THE NEXT 10 YEARS

- Brief Overview CARGILL INC./CARGILL LIMITED/CARGILL FOODS
- Present Profile of Canadian/United States Beef Processing Industries
- PRESENT INDUSTRY CHARACTERISTICS:
  - Consolidation "Rationalization"
  - North American Competitiveness "Increasing Competition"
  - Demographics "Aging Population"
  - Consumer Demands "Convenience, Quality and Price"
  - Grading System "In Transition"
  - Government Policies
- "THE FUTURE" - MORE "CONSOLIDATION"
  - Globalization "Global Market"
  - Environment
  - Food Safety
  - Total Quality
  - Customer Satisfaction "SERVICE, SERVICE, SERVICE"
  - Marketing vs. Selling
- IMPLICATIONS FOR PRODUCERS/PROCESSORS
  - Intense Competition For Consumer Spending
  - Complex, Competitive Labour Markets
  - Expanded Industry Cooperation
  - Close Working Relationships
  - Joint Ventures/Partnerships
  - Increased Research and Development

SUMMARY OF A YEAR-ROUND COW-CALF HEALTH PROGRAM

Dr. John Jacobsen, MSD Agvet, Calgary

PRE-BREEDING

1/ Management

a/ Replacement heifers - selected on the basis of the following criteria:

i) breeding weight required - critical minimum weight (CMW)
ii) age at the time of breeding - born in first 21 days of the calving span
iii) pelvic measurement score
iv) birth weight
v) dams with above average production records
vi) structural correctness, femininity, udder soundness, disposition

b/ Bulls

i) bulls semen evaluation, soundness examination, mating potential
ii) bulls selected for breeding of replacement heifers on the basis of calving ease potential

2/ Health considerations

a) Replacement heifers
- vaccination for IBR/BVD and vibriosis

b) Bulls
- hoof care

c) Cows
- vibriosis vaccination

d) Calves
- castration/dehorning
- 8-way clostridial vaccination
- growth implants
- fly tags

3/ Nutrition

a) Replacement heifers/cows
- individual rations for these groups
- replacement heifers - flushing ration
- cows - ration required to maintain lactation and prepare for breeding

b) Bulls
- ration designed to meet maintenance requirements and to prepare for breeding - should be in place at least 60 days prior to breeding season

SUMMARY OF A YEAR-ROUND COW-CALF HEALTH PROGRAM

BREEDING

1/ Management

a/ Replacement heifers
- may begin breeding 3 weeks prior to main cow herd
- twice daily observation to observe for:
  i) estrus activity
  ii) heifers being bred
  iii) bulls active and breeding
- observe for heifers being rebred in the second cycle
- breed heifers for 42 days

b/ First calf heifers
- begin breeding 10 days prior to main cow herd
- breed for 50 days
- observe for cows being rebred in the second cycle

c/ Cows
- breed for 42 days
- observe for cows being rebred in the second cycle

d/ Bulls
- bulls with decreased libido, lameness or exhaustion should be removed immediately and replaced
- rotate bulls on a weekly basis to ensure maximum libido

2/ Health

Cows/calves/replacement heifers/bulls
- observe for general health
- individual animals treated as per written protocol from veterinarian

3/ Nutrition

a/ Breeding animals
- supplementary ration if necessary
- minerals

b/ Calves
- creep feeding ration if necessary

SUMMARY OF A YEAR-ROUND COW-CALF HEALTH PROGRAM

POST-BREEDING TO WEANING

1/ Management - pregnancy evaluations on a group basis

a/ Replacement heifers
- 60 days following removal of the bulls allows nonpregnant heifers to be removed and sold if market conditions allow

b/ Cows
- 60 days following removal of the bulls or to coincide with the preconditioning program of the calves

c/ Bulls
- evaluation of each individual - older bulls and bulls with chronic lameness or poor reproductive status sent to market

d/ Calves
- preconditioning program established

2/ Health - all groups observed for general health

a/ Replacement heifers
- reevaluation of the heifers and further culling if necessary
- first dose of scour vaccine
- IBR booster

b/ Cows
- individual animals culled as per health problems - poor feet, udders, vaginal prolapses, etc.
- IBR booster

c/ Calves
- preconditioning vaccinations - IBR/BVD, H. somnus, 8-way clostridial

3/ Nutrition

- as all groups are on summer pasture, the need for additional nutrition is minimal except for creep feeding of the calves if necessary
- ensure trace minerals intake is adequate

SUMMARY OF A YEAR-ROUND COW-CALF HEALTH PROGRAM

WEANING

1/ Management

- all calves weighed at weaning
- steer calves sent to market at weaning or kept a minimum of 60 days to overcome the stress of weaning
- weaned calves observed two to three times per day for detection of bovine respiratory disease (BRD)
- cows turned back out to fall pasture until winter feeding program established
- calves from first calf heifers should be weaned early to allow the heifers to regain condition lost during first lactation

2/ Health

a/ Calves
- booster vaccinations for IBR/BVD and H. somnus
- deworming/warble control
- treated for BRD as necessary
- steers re-implanted if being backgrounded

b/ Cows, Replacement heifers and Bulls
- deworming/warble control
- cows and heifers observed for abortions - all feti recovered submitted to pathology laboratory for diagnosis

3/ Nutrition

a/ Calves
- roughage fed at beginning of weaning period until all consuming readily
- a backgrounding ration or replacement heifer growth ration added to roughage

b/ Cows and Bulls
- fall pasture or maintenance ration

SUMMARY OF A YEAR-ROUND COW-CALF HEALTH PROGRAM

WINTERING

1/ Management

- establish nutritional programs for all groups in herd and maintain observation of general health
- analyze records from pregnancy evaluations and weaning data - cull cows with poor production records (MPPA)
- weigh replacement heifers to ensure CMW will be reached by breeding

2/ Health

a/ Calves
- daily observation for infectious disease and treatment as necessary

b/ Cows
- daily observation for evidence of abortion or pregnancy related problems

3/ Nutrition

- feed analysis of all foodstuffs intended for winter nutritional programs to allow for precise ration formulation for the different groups as follows:

a/ replacement heifer calves
b/ first calf heifers
c/ cows
- cows in thin to moderate condition
- cows in good body condition

d/ bulls

SUMMARY OF A YEAR-ROUND COW-CALF HEALTH PROGRAM

PRE-CALVING

1/ Management

- preparation of the calving areas and turn-out pastures
- check inventory of necessary calving supplies

2/ Health

a/ Cows and heifers
- annual or second booster of scour vaccine
- injections of selenium and vitamins ADE if necessary
- observed for general health and pregnancy associated problems

b/ Bulls
- observed for general health and potential frostbite on scrotum

3/ Nutrition

a/ Bred replacement heifers
- ration fine tuning to allow for proper udder development resulting in increased quality and quantity of colostrum

b/ Cows
- ration fine tuned to ensure that energy and protein levels are being met for the last trimester of pregnancy and early post-calving lactation needs

c/ Bulls
- maintenance ration

SUMMARY OF A YEAR-ROUND COW-CALF HEALTH PROGRAM

CALVING

1/ Management

a/ First calf heifers
- observation of the heifer calving group every 3 to 4 hours
- all calves weighed and identified at birth
- pairs moved to turnout pasture to minimize neonatal disease and to allow for close observation

b/ Cows
- observation of the cow calving group every 6 hours
- all calves weighed and identified at birth
- pairs moved to turnout pasture to minimize neonatal disease and to allow for close observation

2/ Health

a/ Calves
- navel treated with tamed iodine
- observed to ensure adequate colostral intake in the first 6 hours of life - if not, colostrum administered by bottle or stomach tube
- injected with selenium and vitamins ADE if necessary
- treated for scours with electrolytes and antibiotics (if necessary)

b/ First calf heifers and Cows
- treated for post-partum disease such as retained placentas, metritis, mastitis, hypocalcemia/hypomagnesemia, etc.

3/ Nutrition

- all lactating females should be placed on a ration formulated to allow for increasing needs of lactation and also to ensure return to estral activity prior to breeding

EPDs - WHAT ARE THEY DOING FOR US?

prepared by Milton Weiss

Freelance Genetics Consultant

Introduction

Beef cattle evaluation programs have undergone rapid evolution over the past 20 years. In 1971-72 the American Simmental Association published the first U.S. National Beef Sire Summary. Bulls were, for the first time, compared across herds and generations. Other breed associations quickly followed this example. For those early sire evaluations standard statistical methods were used.

In 1972 Dr. C.R. Henderson of Cornell University formalized his mixed model procedures which provided "Best Linear Unbiased Predictions" (BLUP) of breeding values (EBVs, EBV = 2*EPD). Agriculture Canada, in conjunction with the University of Guelph, began the development of their Beef Sire Monitoring Program (BSMP) around this time. These early sire evaluations utilized progeny information only. Henderson and Quaas as early as 1976 discussed methods for BLUP breeding value estimation utilizing records on relatives as well as the individual's own performance. The mathematical model, called the "Animal Model" by Pollak and Quaas of Cornell University was less dependent on hard-to-verify assumptions than earlier models. It incorporated the individuals own performance record into the analysis and also produced genetic values for dams and young animals not yet progeny proven (non-parents).

This "animal model" along with increased use of AI seemed to provide an ideal basis for genetic evaluation of beef breeds. However, the complexity of the model was too much for the "best" computers available. In 1980 Quaas and Pollak proposed the reduced animal model (RAM) but even this model was too complex.

It was 1984 before available computer technology was able to handle this RAM methodology for genetic evaluations and the model was first applied to large beef cattle populations. The RAM technology for prediction of genetic values was rapidly adopted across the beef cattle industry in both the U.S. and Canada since the commercial sector could now share directly in the genetic progress of the purebred industry.

What are the advantages claimed for this RAM model?

1. It incorporates progeny, pedigree, and own performance into one value for each trait.
2. It accounts for non-random matings.
3. It accounts for genetic trend.
4. It provides EPDs for all animals with performance data in the data base (parents and non-parents).
5. It provides evaluations for growth and milk simultaneously.
6. It enhances the accuracy of prediction.
7. It provides the information needed for interim within herd EPD calculations.

EPDs - Do They Work?

There is scant published research supporting the advantages of EPDs in selection studies. However the work that has been done, mostly in the U.S., shows positive relationships between EPDs of selected sires and progeny performance. This work has been primarily single trait selection on growth traits (birth weight, weaning weight and yearling weight).

In Canada a joint project by the Canadian Hereford Association and Alberta Agriculture funded by Farming for the Future is of particular interest. Cows and heifers (246 in all) in two commercial straightbred hereford herds in southern Alberta were bred at random to one of seven bulls. EPDs on the sires came from the following sources:

1. The Ag Canada BSEP summaries for 1989 fall (AC89F), 1990 spring (AC90S), 1990 fall (AC90F).
2. The Hereford Association sire summary for 1989 (HE89).

The relationship between the actual progeny performance of the sires and that predicted by their EPDs was determined by linear regression. Progeny performance was measured by least squares means for each trait after adjustment for herd, sex of calf, and age of dam. Table 1 summarizes the actual progeny performance vs. EPD part of this study.

Conclusions drawn by the authors of this report are of interest. The sire's EPDs for birthweight, weaning gain

(weight) and yearling gain (weight) were positively (meaningfully) related to the actual progeny performance. These EPD values are reliable and therefore useful tools for the selection of sires in both commercial and purebred herds. However, the EPDs for calving ease, weaning milk and maternal gain are less reliable and should be used with caution.

Table 1. The amount of variation in sire progeny averages accounted for by differences in EPDs (expressed as R^2*100) for several traits.

EPD	Trait	Source of EPD			
		AC89F	AC90S	AC90F	HE89
Ease	Diff. Births[1]	18.9	0.1	13.2	8.7
Bwt.	Birth weight[2]	----	56.2	55.2	35.7
Gain-wn	Weaning wt.	49.2	72.9*	66.1*	81.6**
Milk	" "	0.1	6.4	43.8	0.2
Mat. gain	" "	0.5	29.5	3.5	87.9**
Gain-ylg	Yearling wt.	77.8*	78.2**	90.1**	47.1

1 Difficult birth data used from 2-yr old heifers only.

2 Birthweight data used from all cows calving.

* Significant at P= 0.05

** " " P= 0.01

The authors made some pertinent recommendations but these will be incorporated with overall comments later.

Crow et al (Manitoba) in an extension bulletin on "Consequences of selection for yearling weight in beef cattle" funded by ERDA looked at the use of BLUP and EPDs as an alternative to classical methods for measuring genetic progress from selection. The data was from the long term Shorthorn selection project at Brandon with yearling weight as the trait of selection. The genetic changes (trends) estimated by the BLUP procedures were much lower than with standard methods under two levels of heritabilities used in the study. Rankings of a small set of sires from the select line did not change appreciably but the magnitude of the EBVs did (table 2). They concluded that the analysis indicated reason for concern with the application of the animal model to breeders' herds.

Table 2. EBVs for ten select line sires as affected by the heritabilities used in calculating EBVs for post weaning gain.

Sire	High h^2 (A)	Low h^2 (B)	Change (A-B)
8	-10.2	-5.4	-4.8
14	4.5	7.5	-3.0
18	20.5	22.1	-1.6
40	35.9	32.0	3.9
44	8.1	2.2	5.9
55	3.3	0.5	2.8
64	6.4	3.6	2.8
70	18.4	13.1	5.3
75	19.0	15.9	3.1
85	-21.3	-17.4	-3.9

Comparison of sire evaluations

The following example is from a paper submitted for publication by Ag Canada personnel. The data used to derive the BSEP Hereford sire evaluations was subdivided into that from purebred sources and that from crossbred sources. Table 3 contains the correlations of beef sire proofs from these two sources.

Table 3. Correlations between sire proofs of Hereford sires obtained from purebred and crossbred data sets as per BSEP procedures.

	Trait	CE	WG	YG	MCE	MWG
Rep.≥10	No. sires	316	1010	662	77	337
	Est. corr.	.13	.20	.29	.33	.27
	Exp. corr.	.32	.43	.45	.25	.32
Rep.≥40	No. sires	26	278	180	0	17
	Est. corr.	.19	.27	.37	--	.23
	Exp. corr.	.56	.64	.65	--	.62
Rep.≥80	No. sires	0	5	5	0	0
	Est. corr.	--	.65	.65	--	--
	Exp. corr.	--	.87	.87	--	--

Note - Expected correlation is a theoretical value used for the comparison of sire proofs from independent data sources.

It is obvious that the estimated correlations fell far short of expected with the exception of that for MCE (maternal calving ease) when repeatability was ≥ 10. I would interpret these results as an indication that data from commercial herds is not as reliable for the estimation of genetic merit.

Ag Canada is currently analyzing the Canadian Charolais data with and without commercial data in the database to study the effect commercial data has on the genetic evaluations.

Comparison of evaluations - different sources but similar data. The Canadian Charolais Association has its genetic evaluation carried out under contract by the University of Georgia. I recently performed a correlation analysis comparing the EPDs from BSEP with those provided to the CCA. This was part of an on going study by Ag Canada, the Univ. of Georgia, Colorado State Univ., the American International Charolais Assn. and the CCA to reconcile differences in evaluations provided to the industry. Correlations were calculated between comparable traits for bulls appearing in the BSEP and CCA sire summaries. Table 4 gives the results of this study. The two evaluations are conducted using similar statistical methodology but different computing strategies. Another difference is that BSEP utilizes the same data as the CCA but augments it by the inclusion of commercial (and a small amount of purebred) herd data from ROP and BHIP. Two other possible sources of variance are the genetic parameters used in the analysis as well as

the adjustment factors utilized for sex, age of dam and estimates of birthweight.

Table 4. Correlations between comparable traits in the BSEP and CCA 1990 spring sire evaluations.

		BSEP Trait EPDs.			
		Ease	Weaning gain	Ylg gain	Milk
	Bwt.	-0.37	0.26	0.29	-0.12
CCA	Wwt.	-0.16	0.70	0.65	-0.48
Trait	Ylgwt.	-0.17	0.66	0.70	-0.48
EPDs	Wngain	-0.06	0.69	0.62	-0.48
	Ylggain	-0.11	0.65	0.69	-0.48
	Milk	-0.02	0.03	0.00	0.53

Notes - 1) The underlined r-values are for comparison of comparable traits between the two evaluations.

2) All values with an absolute value $\geq$ 0.10 are significant at the P= 0.05 level.

In my report I suggested that these correlations were too low when we were comparing evaluations on the same sires from overlapping data sets. I suggested limiting the BSEP analysis to CHARM data only to see if this proved more successful. We should also look at the genetic parameters, connectedness rules, contemporary grouping, and adjustment factors utilized to see what affect they have on the sire proofs generated.

Ag Canada pointed out that correlations between sire proofs are

not expected to be that high and are dependent on the accuracies of the proofs - this of course assumes independent data sets. They were happy with these correlations. In this case the data sets were not independent and I expected better results.

Another study which I carried out myself dealt with calving ease versus birthweight EPDs on the same sires. The sources for EPDs for this study were:

1) BSEP sire summaries for spring and fall 1990.
2) CCA sire summary for spring 1990.

Table 5 contains the results from this study.

Table 5. Correlations between birthweight and calving ease EPDs from BSEP and CCA sire summaries for 1990 (n = 169 sires).

Source	Trait	CE90S	CE90F	BW90F	BW90S
AC	CE90S	1.00			
AC	CE90F	0.85	1.00		
AC	BW90F	-0.46	-0.48	1.00	
CCA	BW90S	-0.54	-0.49	0.89	1.00

Note - these correlations are all significant at P= 0.05.

These results are much more encouraging with the exception of the correlation between CE90S (AC) and CE90F (AC) of 0.85. This correlation should be much higher since little or no calving data was added to the database between these two evaluations. The correlation between the two sets of birthweight EPDs was very good (0.89) even though they were

from different sources. The correlations between calving ease and birthweight were all around -0.50 which is about what one would expect because birthweight only accounts for about 30 percent of the variation in calving ease in most studies.

Why do EPD evaluations lack credibility?

We are told that we shouldn't compare sire evaluations from different summaries but I am going to compare EPDs on a few selected sires from recent BSEP reports (table 6).

Table 6. A few noteworthy examples of EPD variability from the same source but different reports.

	Weaning gain EPD			Yearling gain EPD		
Sire	1989S	1990S	1990F	1989S	1990S	1990F
PMC 77744	25(89)	44(95)	25(95)	51(90)	93(94)	57(95)
PMC 71057	18(87)	43(94)	19(95)	27(86)	58(92)	31(94)
MC 68400	20(95)	42(97)	27(97)	31(95)	64(97)	44(97)

Notes - 1. The values in brackets are accuracy estimates.

2. The number of herds represented ranged from 10 to 38 while the number of calves ranged from 55 to 287.

You will notice that these sires (all trait leaders for weaning gain) had very high EPDs in the 1990 spring report but came back down in the 1990 fall report to near those EPD values reported in the spring of 1989. These are all very high accuracy bulls with a lot of herds and progeny represented by each of them. This kind of fluctuation in EPD values is more than enough to shake breeder confidence in genetic evaluations since all three reports were from the same source.

Recommendations on how to use EPDs is another cause for concern. We are told to use high accuracy bulls in our breeding programs. The only way you can use a high accuracy bull is by AI and this is not that popular now even in purebred herds. Accuracy is a function of pedigree information, own performance, and progeny performance. It requires progeny in three or more herds, an accuracy of at least 40% for weaning gain, at least one progeny in the last five years and the sire has to be connected to the national population (at least one calf by the sire must be in a contemporary group with at least one calf from a nationally proven sire) before a sires EPDs are eligible for publication. Figure 1 shows the time required for a sire to achieve accuracy.

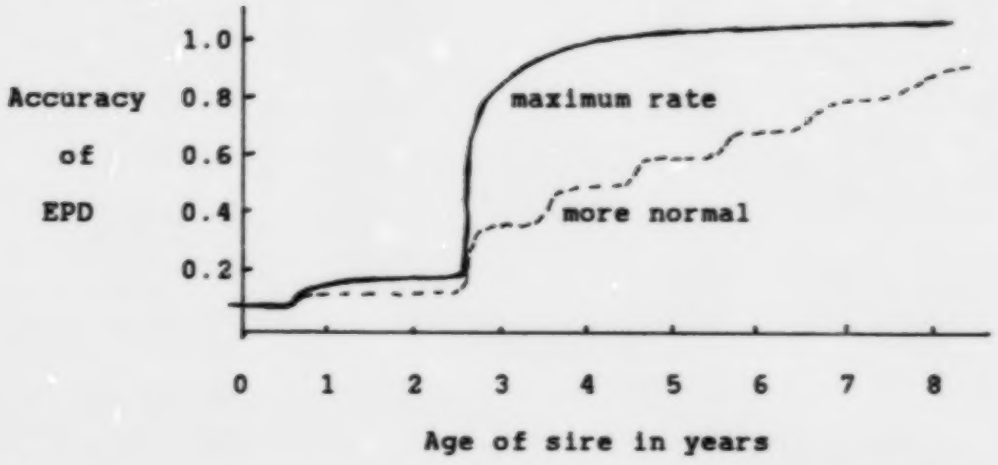


Figure 1. Time in years required for a sire to gain accuracy.

When you, as a bull buyer, go out to purchase a bull you will select either a yearling or 2-yr old bull, no matter what the source. You may use within-herd EPDs in your overall

assessment of the candidate bulls - or you may use sire summaries to look at EPDs of his sire. In any case you will be buying a bull with low accuracies.

A major problem with the present systems is that they are progeny-driven ie. calves must be weaned or the record is dropped from the analysis. We need to change to a cow-driven system where all calving records are included in the analysis. A lot of the difficult birth and/or heavy birthweight calvings result in dead calves at birth or prior to weaning and the producer or the system deletes the records from analysis. If they were included in the analysis a lot of the difficulty with calving ease and birthweight EPDs might be resolved.

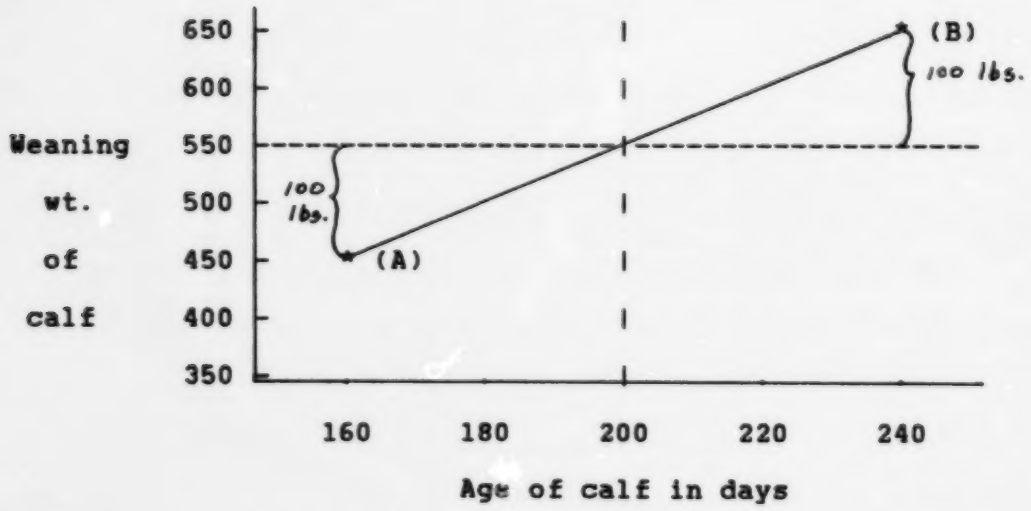


Figure 2. The distortion of cow performance when weaning weight is adjusted to 200 days of age.

Another problem is with cow EPDs for calf growth to weaning which uses calf weaning weight adjusted to 200 days of age. This is fine for measuring calf performance or calculating EPDs on sires. It is probably justifiable in purebred herds where genetic merit of cows is important. However, in commercial herds it is the actual pounds of calf sold that is important and in commercial herds cows should be rated on this basis (see figure 2). Under the present system an early calving cow (cow B), is penalized while a late calving cow (cow A) is given a bonus. In the simplistic example presented this amounts to 100 pounds per cow or a total of 200 pounds difference in actual production totally ignored.

Industry perception of genetic evaluation in the beef sector.
We have been criticized by many industry players (mostly from government, A.I. institutions and Universities) for not maximizing genetic progress from genetic evaluation systems like the dairy industry has. They say we must move ahead with the technology of the times (EPDs, embryo transfer, and other Hi-tech opportunities as they arise such as semen/embryo sexing and embryo splitting etc.). The concern is that we are losing access to valuable international markets for semen, embryos, and purebred breeding stock. They insist that we must have:-

-industry leadership and co-operation.

-clearly defined industry breeding objectives.

-a respected genetic evaluation system.

I agree with the above three points but let's keep things in

perspective. The dairy industry has an open ended system - there is no upper limit placed on the selection criteria (milk, fat and protein).

The end product in the beef system has limits placed on the end product, with these limits often seriously modified after breeding has taken place. Currently these limits include;-

-live weight at slaughter -approx. 1100-1250 pounds.

-fat cover to grade A1.

-marbling score 6-9 with some emphasis on increased marbling

-rib-eye area of about 12-15 sq. in.

The commercial segment of our industry is the most important as it is the segment which suffers first and most directly if the end-product does not meet consumer or packer requirements. The purebred segment is next in importance and its main function and source of income is sales of bulls and/or breeding stock to the commercial industry. Semen sales domestically to support the above are a small but significant part of the overall picture. However, exports of top genetics material (semen, embryos and breeding stock), only benefit a very small part of the industry with possibly the biggest winners being the government and industry representatives who get the fancy all expense paid trips abroad.

Conclusions and recommendations.

1) EPDs are working well for growth traits.

2) Indirect trait EPDs as well as calving ease EPDs are not very useful or reliable at the present time.

3) Genetic parameters and adjustment factors used in the analysis require serious study - some standardization between evaluation centers would be desirable.

4) The rules for connectedness need review. I would like to see the requirement increased from one to at least three calves from a nationally recognized sire in a herd before it is considered connected.

5) Keep minimum contemporary group size at five - there is some pressure to reduce this requirement to three. Some programs do not account for changes in contemporary groupings at weaning - they must to improve EPD estimation.

6) Actual birthweights should be required before herd data is used in national genetic evaluation programs. This would produce much better birthweight EPDs and remove the need for estimated birthweights in adjusted weaning weight calculations thereby improving all growth EPDs.

7) Only data from purebred herds should be used in national evaluations. Eligible data would come from Breed Associations, ROP and BHIP.

8) A strong within-herd program to meet the specific needs of the commercial sector operating at the local, provincial, regional or national level must be developed. This program would require information from the national evaluation program.

9) Some other traits that can be directly measured should be considered: scrotal circumference at a year of age, height (hip or shoulder) or framescore at a year of age and for heifers - age at first estrus. Scrotal circumference and age at first estrus could be valuable fertility traits while frame score, which has gotten out of hand, needs monitoring.

Theoretically the procedures used in genetic evaluations are sound. There needs to be considerable research to fine tune some areas ie. genetic parameters. The indirectly measured or estimated traits require more attention at this time than the directly measured traits.

What we need first is to improve the quality of the evaluations, then to expand the concepts (indices, across breed comparisons, use of crossbred data, etc.) presented in the evaluation. Quality and cohesive progress will bring respectability and credibility to the system.

Acknowledgements

I wish to acknowledge the co-operation of the Canadian Hereford and Canadian Charolais Associations for providing much of the material used in this presentation. Those people responsible for the sire evaluations and other material used are also acknowledged. I wish to thank the organizers and participants of this seminar for the opportunity to present this material.

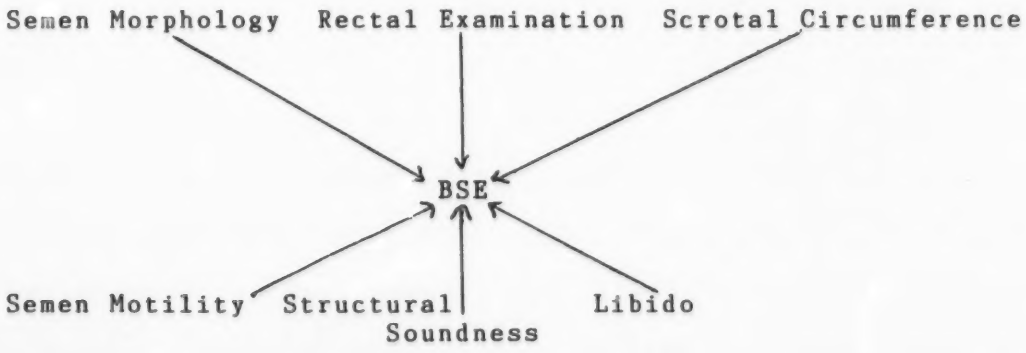
Evaluation of Breeding Bulls

Dr. Chris Belan, D.V.M., Regina, Saskatchewan

Over the past 10 years, Breeding Soundness Evaluations, or Semen Testing of beef bull batteries, has become a common proceedure in Western Canada. It is the purpose of this presentation to outline the current trends, and changes, as they pertain to Breeding Soundness Evaluations.

Breeding Soundness Evaluations are not guarantees. We must remember that we are not dealing with machines with interchangeable parts, but living biological systems that, despite our best attempts, still manage to provide a certain degree of unpredictability. I tend to look at BSE (Breeding Soundness Evaluations) as insurance exams, interpreting the findings in the same vein. The more insurance you purchase, the better one is prepared for the unexpected.

Over the past 10 years, when I speak to individuals, or groups, in regards to BSE, I stress a wholistic approach to the subject. BSE is not just a semen test or a scrotal circumference, "it is the culmination of a number of inputs that have to be evaluated together to provide an appropriate disposition for the individual examined."



Let us look at each of the components of the BSE:

Scrotal Circumference

In a nut shell, testicular weight is the most accurate measure of semen production. The more the testicles weigh, the more spermatazoa that are produced.

Considering the practicality of obtaining testicular weights, the most repeatable, practical, linear measurement that reflects testicular weight is Scrotal Circumference. The scrotal circumference is taken with the testicles drawn well down into th scrotum. The measuring devise is placed around the largest portion of the scrotum and pressure is drawn, on the tape, until the natural resilience, on the testicles, is eliminated. On yearling bulls this is usually 1-1.5 cm,(reference to table 2.) less than the measurement obtained when a snug contact is made with the testicle. On an older bull the difference may be up to 2.5 cms and the testicles normal.

At the time the scrotal circumference is taken, a thorough examination of the testicles, epididymis and scrotum is performed, with any abnormalities being noted. (reference to plates 5&6)

Between 10 and 14 months of age beef bulls undergo a steady growth in scrotal circumference of 1.5cm every 30 days. There is a variation in scrotal circumference between breeds and it is appropriate to use different minimums for different breeds. I personally use a minimum of 30 cm for yearling bulls of breeds that require less than 30 for a breed minimum standard. (reference to table 3)

TABLE 3

Age (months)	Breed			
	Simmental*	Angus, Charolais & Maine Anjou	Hereford & Shorthorn	Others
		(cm)		
12-14	33	32	31	30
15-20	35	34	33	32
21-30	36	35	34	33
>30	37	36	35	34

*Minimum measurement recommended by Canadian Simmental Association.

Rectal Examination

At the time the BSE is performed, every animal should have a Rectal Examination. This serves three functions.

1. Rectal massage removes feces from the rectum and allows better contact between the rectal mucosa and the probe.
2. Rectal massage provides stimulus to the base of the penis, and in some cases may provide enough stimulus to cause ejaculation.
3. Allows the examiner to evaluate the internal sex organs. (mainly Seminal vesicles) to determine if any desease process is present.

Semen Motility

Semen Motility is an evaluation of the samples ability to move. When the sample is viewed grossly, it should have a swirl reminissent to a turbulent thunder cloud.

A cover slip is then placed over part of the sample and the individual motility is evaluated. A satisfactory sample will show progressive linear motility.

The motility is quite dependent on temperature and collection technique. A sudden temperature change or contamination, by a small amount of urine will make a good sample appear the opposite.

Semen Morphology

Morphological examination of the sample is a determination of normal verses abnormal spermatazoa. All semen samples contain a percentage of defective semen. The number and type can vary widely.

Some defects are transient with only a temporary affect on fertility while others, even at moderate to low levels, can impair fertility.

Standard proceedure is to use an eosin and nigrin stain to stain a portion of the sample used for motility evaluation. At least 100 cells are counted in a randomized fashion, and the percentage of normal to abnormal is recorded. Care should be taken to record both types and percentages of specific defects. (reference to plates 13,14&15)

Structural Soundness

When the BSE is performed it is imperative that the animal be evaluated for Structural Soundness. Defects of feet and legs account for a substantial number of breeding failures. The development of arthritis in stifles, hips or backs, is one of the leading reasons that bulls will fail to perform. If

the bull does not have a set of feet and legs that allow him to perform his job, the best semen in the world is of little benefit. (reference to table 1, and to plate 3)

Libido

The final component of a BSE is an evaluation of Libido, or sex drive. This component is the hardest to evaluate in a clinical setting.

Although clinical libido tests have been devised, their value is questionable. No matter how good the bull's conformation is, or how well he has scored on all other components of the BSE, it is imperative that careful observation of the bull in a natural breeding situation be undertaken.

If attention is paid to all these areas, much of the risk related to breeding failure will be reduced. Remember, all these areas, as well as the fertility of the female, make up the formula to herd fertility. This formula is not an additive one but a "product of sums." (reference to formula Example 1) Poor performance in any one area, can't be averaged out.

(Table pg.3)

In the final analysis, BSE is a valuable management tool, but remember it is only one component in the fertility formula.

In my practice, I do BSE for two groups:

1. Breeders or Test Stations that require BSEs prior to sales.
2. For purebred and commercial breeders, on their own bull batteries prior to breeding season.

In both situations, for a BSE program to work, there has to be a mutual respect and confidence, on the relationship between Veterinarian and producer.

The veterinarian must be experienced at the art of BSE, as well as the science. The produ..er must be knowledgeable of the limitations of the BSE.

As veterinarians, we respond to the demands our clients place on us. Ideally, every bull should be collected two weeks prior to breeding season, using a teaser cow and an artificial vagina. We all know this is ideal but not realistic. Considering the game plan that veterinarians are expected to conform to, it is not unexpected the BSE to offer a degree of error.

In closing BSE is a routine, inexpensive proceedure, that is intricate to both successful breeding and marketing programs.

Table 2

EXPECTED AVERAGE SCROTAL CIRCUMFERENCE OF BULLS OF BEEF BREEDS COMPARED BY AGE (CM)

AGE (days)	ANGUS	CHAROLAIS	GALLOWAY	HEREFORD	MAINE ANJOU	SIMMENTAL	SHORTHORN
210	21.5*	20.5	20.1	21.0	20.5	22.4	21.0
220	22.5	21.5	21.0	22.0	21.5	23.4	21.9
230	23.5	22.4	21.9	22.9	22.4	24.5	22.8
240	24.5	23.4	22.8	23.8	23.4	25.5	23.7
250	25.4	24.3	23.7	24.6	24.3	26.4	24.5
260	26.3	25.1	24.5	25.4	25.1	27.3	25.3
270	27.1	25.9	25.2	26.1	25.9	28.2	26.1
280	27.9	26.7	26.0	26.9	26.7	29.1	26.8
290	28.7	27.5	26.6	27.5	27.5	29.9	27.5
300	29.4	28.2	27.3	28.1	28.2	30.6	28.1
310	30.1	28.9	27.9	28.7	28.9	31.4	28.7
320	30.7	29.5	28.5	29.3	29.6	32.1	29.2
330	31.3	30.1	29.0	29.8	30.2	32.7	29.8
340	31.9	30.7	29.5	30.2	30.8	33.3	30.2
350	32.4	31.2	30.0	30.6	31.3	33.9	30.6
360	32.9	31.7	30.4	31.0	31.8	34.5	31.0
370	33.4	32.2	30.8	31.3	32.3	35.0	31.4
380	33.8	32.6	31.2	31.6	32.7	35.4	31.7
390	34.2	33.0	31.5	31.9	33.2	35.9	31.9

How to determine whether a bull's scrotal circumference will be satisfactory at 12-14 months of age.

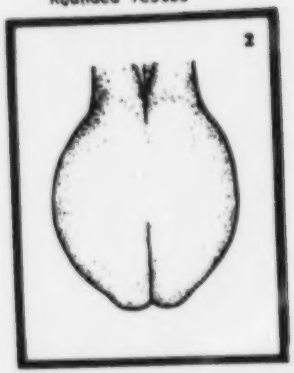
Select the bull's age (in days) at the time of measurement and read over to the right under the correct breed. Determine how much the bull is above or below the average scrotal circumference for that breed at that age. The bull is likely to be a similar amount above or below breed average at 12-14 months of age. A bull more than 2 cm below breed average should not be selected for breeding purposes.

Plate 5

Variatons of Normal Scrotal Conformation

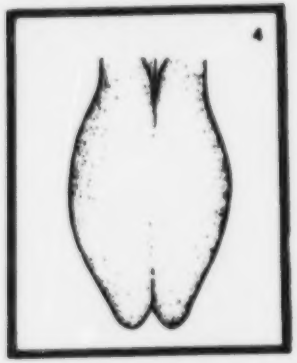
Elongated Testes

Rounded Testes



Rotated Testes

Distinctly Cleaved Testes

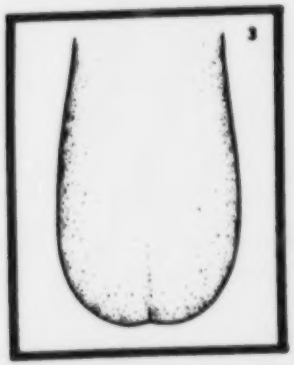


Abnormal Scrotal Conformation

Testes Held Too Close

Unilateral Hypoplasia

Scrotal Hernia



Incomplete Descent

Plate 13. Normal Sperm and Common Secondary Sperm Abnormalities.

Number 1. Normal sperm, narrow head.

Number 2. Normal sperm, broad head.

Number 3. Reversed tail with droplet.

Number 4. Kinked tail with droplet.

Number 5. Kinked tail that has shed droplet.

Number 6. Slightly kinked tail. (These variations in kinked tails are all related to the process of shedding of the droplet.)

Number 7. Distally coiled tail.

Number 8. Distal droplet.

Number 9. Separated head partly attached.

Number 10. Separated head.

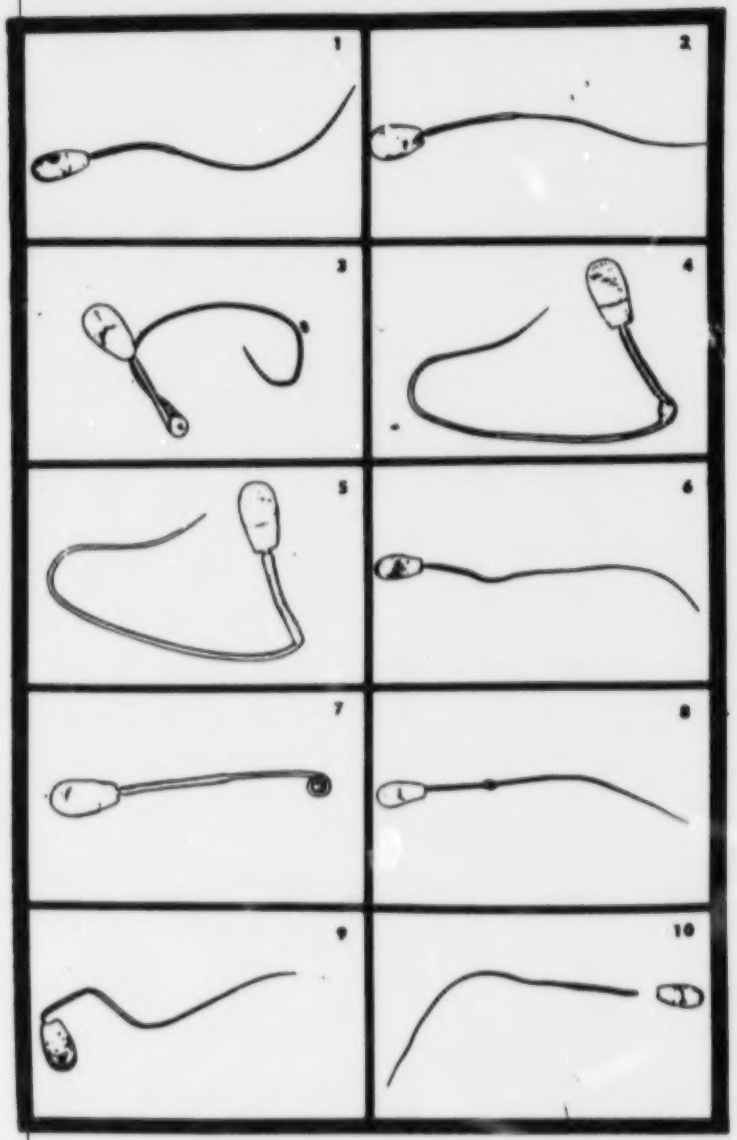


Plate 14. Primary Abnormalities Involving the Midpiece and Tail.

Number 1. Proximal coiled tail involving midpiece.

Number 2. Coiled tail involving the midpiece and swollen midpiece.

Number 3. Tightly coiled tail.

Number 4. Abnormal head and mitochondrial bulge. Distal droplet.

Number 5. Mitochondrial bulge or remnant of distal droplet.

Number 6. Doubled tail.

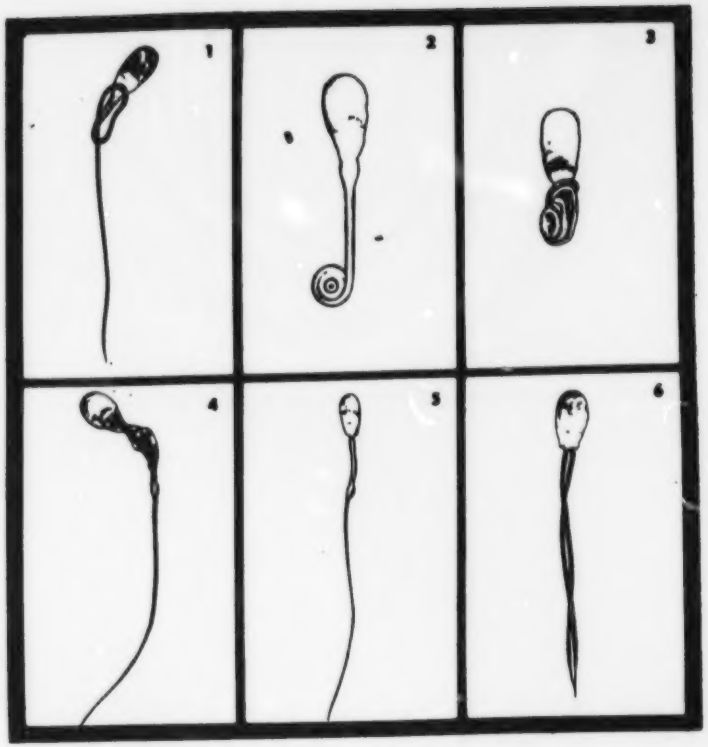


Plate 15. Primary Abnormalities of the Head, Midpiece and Acrosome.

Number 1. Proximal droplet.

Number 2. Swollen acrosome and mitochondrial bulge of the midpiece.

Number 3. Pointed knobbed acrosome and proximal droplet or mitochondrial bulge.

Number 4. Beaded knobbed acrosome.

Number 5. Pointed knobbed acrosome.

Number 6. Ruffled acrosome.

Number 7. Misshapen head.

Number 8. Swollen acrosome, misshaped head.

Number 9. Pyriform head.

Plate 15

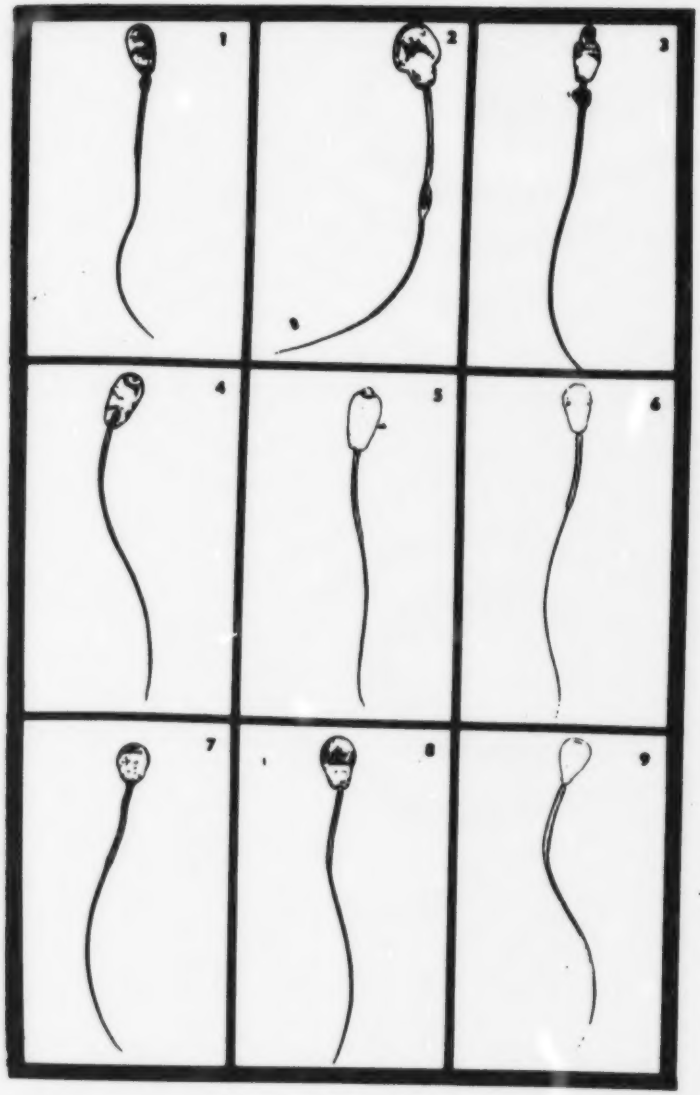
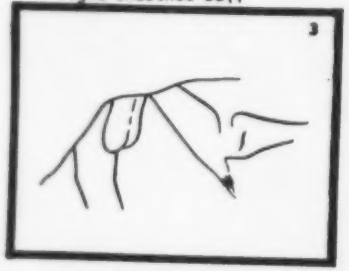


Plate 4

Persistent Penile Frenulum

Everted Prepuce

Tight Sheathed Bull



Pendulous Prepuce

TABLE I

Physical Defects Affecting Breeding Soundness*

Internal Genital Organs	Number Affected	% Affected
Enlarged vesicular glands	338	4.6
Vesicular adenitis	181	2.5
Scrotal hernia	17	0.23
Enlarged inguinal rings	11	0.15
Testicular Defects		
Reduced size and hypoplasia	960	8.8
Soft	806	7.4
Abnormal shape	104	0.98
Fibrosis	47	0.43
Cryptorchid	14	0.12
Defects of Penis and Prepuce		
Deviation	190	1.7
Neoplasms	100	0.91
Persistent penile frenulum	57	0.52
Lacerations	26	0.24
Urethral fistula (hypospadias)	19	0.17
Defects of the epydidymis		
Tumors, abscesses and granulomas	52	0.47
Epididymitis	40	0.36
Segmental aplasia and/or hypoplasia	20	0.18
Defects of the Locomotor System		
Hoof trim needed	336	3.1
Interdigital fibroma (corns)	92	0.84
Nonspecific lameness	61	0.56
Foot rot	38	0.34
Arthritis	35	0.32
Luxations	17	0.15

*Internal genital organ statistics are based on examination of 7,359 bulls, all other systems on 10,940 bulls.

Modified from Carroll et al., 1963.

Plate 3. Rear Leg Conformation.

Number 1. Desirable conformation of the rear legs.

Number 2. Sickle-hock conformation can lead to swollen hocks and lameness.

Number 3. Post-leg bulls lack proper angulation of the hock and stifle joints. They may "stifle." Their pasterns may also break down.

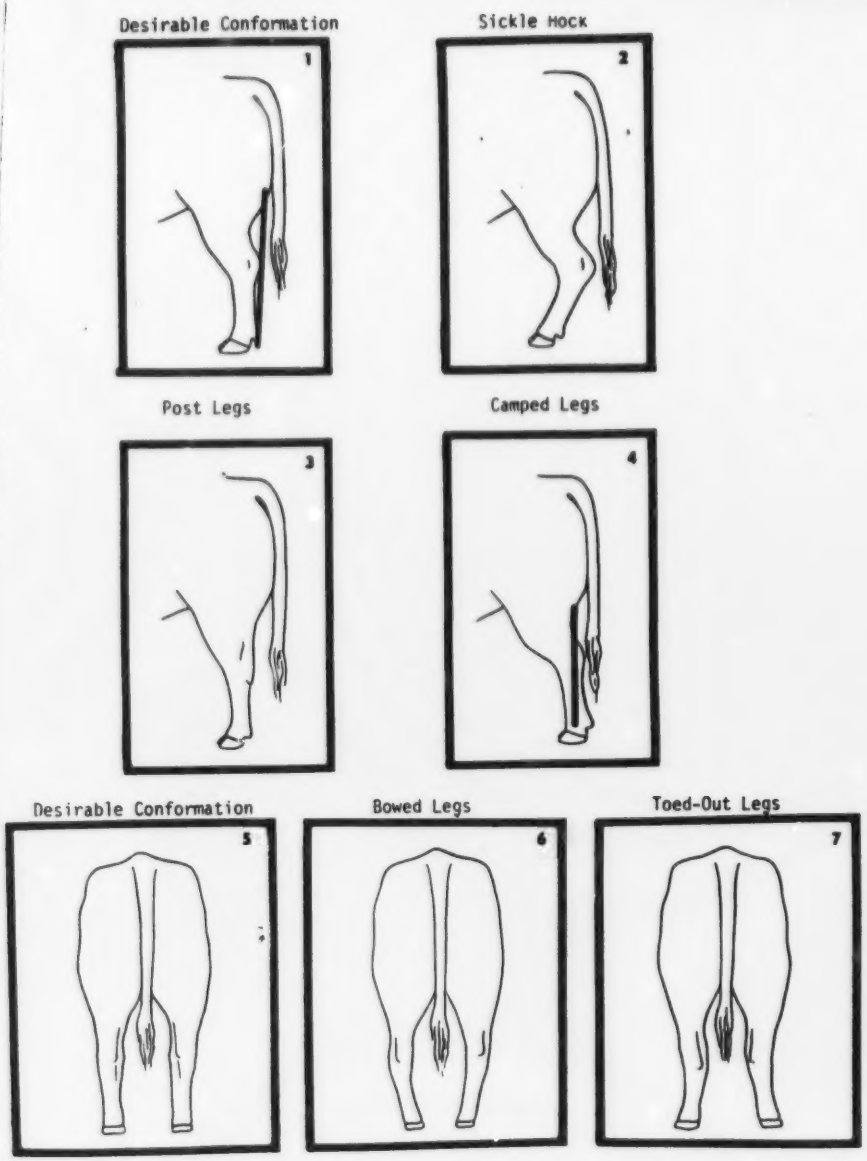
Number 4. Bulls with camped rear legs shift them frequently in efforts to find a comfortable stance. Such bulls also usually have sway-backs.

Number 5. Desirable conformation of the rear legs.

Number 6. Bow-legged bull. The outside wall of the hoof is compressed. The outer toe may curl up and over the inside toe, requiring frequent trimming. Bulls may show lameness from this defect.

Number 7. Toed-out bull. This condition is usually seen in conjunction with sickle-hock conformation.

Reference: Ott RS: Rear leg conformation in bulls: some common structural faults. VM/SAC 71:1592-1595, 1976.



EXAMPLE 1

The number of cows becoming pregnant early in the breeding season is determined by the following formula:

Cows in heat 1st 20 days of breeding	X	Cows pregnant from 1st service	=	Cows pregnant 1st 20 days of breeding season

Cows becoming pregnant from first service is a combination of cow fertility and bull fertility. Therefore, three things must be accomplished if 75% to 80% of the cows are to become pregnant the first 20 days of the breeding season.

1. Ninety-five to 100% of the cows must show heat the first 20 days of the breeding season.
2. Cow fertility must be high.
3. Cows must be bred by a fertile bull.

These three factors are not additive, but multiplicative. In other words, the formula is:

Cows in heat in 20 days	X	Cow Fertility	X	Bull Fertility	=	Cows pregnant in 20 days

Not

$$\frac{\text{Cows in heat in 20 days} + \text{Cow Fertility} + \text{Bull Fertility}}{3} = \text{Cows Pregnant in 20 days}$$

Poor performance in one area can't be averaged out. If one factor is low, then, ultimately, the cows pregnant early in the breeding season will be low. Three examples can illustrate the importance of this concept.

	Cows in Heat 20 days (%)	X	Cow Fertility (%)	X	Bull Fertility (%)	=	Cows Pregnant 20 days (%)
Ex. 1	95	X	95	X	95	=	86
Ex. 2	65	X	95	X	95	=	59
Ex. 3	65	X	95	X	60	=	37

In Example 1, only 86% of the cows are pregnant, even though all factors are 95%. In this equation you do not average the factors, but they are multiplied; consequently, 95% X 95% X 95% = 86%.

In Example 2, only one factor, in heat in 20 days, is low, but note that even though the other two factors are high, only 59% of the cows are pregnant. In Example 3, two of the factors are low; consequently, only 37% of the cows are pregnant early in the breeding season. The proportion pregnant can be no higher than the lowest factor.